MEMORANDUM

TO: Ocean Protection Council

FROM: Valerie Termini, Project Manager

DATE: September 10-11, 2008

RE: California salmonid protection

ATTACHMENT: 1 – Report from the public meetings

PURPOSE:
Salmon have been in decline for a century and a half, and in general, efforts to restore these populations have not produced desired results. This year, for the first time, the Pacific Fishery Management Council (PFMC) closed the commercial and recreational ocean salmon fishery along the West Coast due to low returns of salmonids to Central Valley waterways. Staff believes that the Ocean Protection Council (OPC) can use its role as a leading voice on ocean issues to advocate for clear, long-term policies that will contribute to the reversal of salmon decline.

This memo will give a brief background on salmonid populations in California, a discussion about the many issues related to recovery of stocks, a discussion of the public meetings staff held on salmonids in August 2008, and potential actions the OPC may take to help improve salmonid conservation.

BACKGROUND:
Wild salmon and steelhead have been iconic images of California's natural diversity and abundance since the early 1800s. Stories during the gold rush recount being able to "walk across the backs of salmon and not get your ankles wet" in rivers throughout the West. Yet, wild stocks that have historically supported commercial fisheries have crashed and the industry now depends on hatchery produced salmon. Recreational and commercial fisheries have been restricted and closed due to the poor returns of salmonids to their natal streams. Currently, over 11 species or sub-species of salmon and steelhead in California are federally listed as endangered or threatened. If dramatic action is not taken soon, significant salmonid population loss could occur in the coming decades. Salmonid decline has taken many years to develop and it is likely that it will take some time to present a viable solution to reverse the downward population trend.

Historically, five anadromous salmonid species migrated, reared, and spawned in California's rivers.[1] These include: coho salmon (*Oncorhynchus kisutch*), chinook salmon (*Oncorhynchus tshawytscha*), chum salmon (*Oncorhynchus keta*), pink salmon (*Oncorhynchus gorbuscha*) and steelhead (or anadromous rainbow trout, *Oncorhynchus mykiss*).

Pre-1850s population estimates (based on cannery numbers, survey data, fish landings, and other sources) indicate that historic runs of as many as 3 to 6 million salmonids returned to California's streams each year. In 2007, less than 200,000 natural-origin salmon and steelhead returned to state rivers to spawn.[2] Today, it is estimated that upwards of 90 percent of Central Valley chinook are from hatcheries.

Estimated current abundance of California salmonids compared to historic levels[3]

species	historic (low)	historic (high)	current	%of historic levels (low)	%of historic levels (high)
steelhead	1,641,750	2,641,750	10,000	0.61%	0.38%
coho	200,000	500,000	5,000	2.50%	1.00%
chinook	1,393,000	3,000,000	150,000	10.77%	5.00%
total	3,234,750	6,141,750	165,000	5.10%	2.69%

Human activities have resulted in the extirpation of several distinct salmonid species in California, including:

- two species of chinook, Southern California and Northern Coastal California
- two species of coho, Southern California and California Central Valley
- two species of chum, Northern Coastal California, and California Central Valley
- three species of pink salmon, Northern Coastal California, California Central Valley, and Klamath Mountains Province[4]

Economic impacts:

Ocean and recreational salmon fishing along the West Coast was closed this year due to poor returns of salmonids to the Central Valley – an area that produces 90 percent of the fish that support California's commercial and recreational ocean salmon fishery. As a direct result of this closure, approximately $237 million dollars in losses are expected in the state economy. The California Department of Fish and Game (DFG) have estimated that recreational and commercial fisheries losses are as follows:

- Ocean commercial fishery: $60.2 million
- Recreational ocean fishery: $157.4 million
- Inland central valley recreational fishery: $20 million

[1] Moyle, P. *Fish species of special concern in California*. 2002

[2] estimated from: PFMC February 2008, NOAA Fisheries 2005

[3] Ecotrust, personal communication.

[4] Richard G. Gustafson, Robin S. Waples, James M. Myers, Laurie A. Weitkamp, Gregory J. Bryant, Orlay W. Johnson and Jeffrey J. Hard. 2007. Pacific Salmonid Extinctions: Quantifying Lost and Remaining Diversity. Conservation Biology. 21(4): 1009-1020.

These figures do not include losses to other businesses that rely on a successful salmon fishery, including restaurants, hotels, and bait and tackle shops. Nor do these figures address the loss of natural capital in the environmental services provided by salmonid abundance to forests, streams, and riparian ecosystems. Small communities along the California coast are hit particularly hard by the crash of salmon. Some harbors that supported a fishing industry for many decades are now barely able to hang on to their declining businesses.

KNOWN IMPACTS:
Protecting and enhancing wild populations of salmonids in California has long been a state goal expressed through the enactment of multiple laws designed to protect the rapidly declining species. However, Pacific salmonid populations continue to decline markedly throughout the west coast due to a number of interacting factors.

- Barriers (dams, roads, culverts etc.): Barriers impede passage of salmonids returning to streams to spawn and those fish migrating out to the ocean. Dams have significantly reduced the amount of salmonid spawning habitat and mitigation efforts have contributed new problems. The practice of transporting salmonids around dams has long been an expensive and difficult practice to fisheries managers and engineers. Dams also alter the key characteristics of rivers by altering the temperature, dissolved gasses, sediment transport, and the quantity and timing of water flow. This results in poor habitat for all life histories of salmonids.

- Water Supply: As California's dwindling water supply is increasingly used for more urban, industrial, and agricultural purposes, annual and seasonal river flows have markedly decreased, sometimes drastically impacting salmon populations. Without water in rivers, salmonids cannot reach spawning grounds or return to the ocean. Additionally, as the water supply decreases in rivers, the temperature also increases, making the journey more stressful for migrating stocks and usually resulting in mortality before spawning.

- Water Quality: Water quality impacts are a large factor affecting the health and survival of salmonid species throughout California. Timber practices, dredging, agricultural practices, and urban runoff all impact California's rivers by adding pollutants and changing flow dynamics. Water temperature is also negatively affected when vegetation along stream banks is removed. Non-point pollution sources are widespread and diverse, ranging from agricultural pesticides to pharmaceuticals in sewage discharges to metals from automobile brake pads. All discharges negatively impact salmonids throughout their life history phases.

- Habitat Disturbance/Destruction: Road construction, development pressures, timber harvest, and agricultural operations all change the riparian areas needed for natural ecosystem functions. Salmonids rely on fast-moving, cold water, but timber harvest has increased erosion and sediment into watersheds from logging practices, leading to shallower, slower, and warmer streams. Timber harvest also results in the removal of

large woody debris, which is the source of critical habitat (i.e. deep pools, shaded areas, changes to flow dynamics), essential to various salmonid life cycles.

- Overfishing: Historically, overfishing of salmonids has been a problem. By 1900, many stocks were reduced below levels required to ensure reproductive success, let alone support a fishing industry. By the 1930s stocks were substantially reduced prior to the completion of many dams. Many fishermen now find it difficult or impossible to make a living fishing for salmon.

- Hatcheries: DFG began a hatchery program in the late 1800s as a mitigation tool to offset salmon losses from infrastructure projects like dams and roads. Hatchery-raised fish constitute approximately 90 percent of the ocean fishery catch but these fish are a threat to maintaining wild populations. Studies over the last two decades indicate that hatcheries reduce genetic fitness and genetic variation of both hatchery and naturally spawned salmonid populations. Hatchery stocks can be detrimental to wild fish both as a source of disease and competition when ocean productivity in low and resources are scarce.

- Invasive Species: The introduction of several non-native species has harmed salmonids throughout the state. Examples include animals like striped bass, American shad, and brown trout that prey upon and compete with salmonids. Similarly, non-native grasses and plants like canary grass impede stream flow, block shade-producing trees, and consume precious river water.

- Predation: Natural predation of salmonids is normal; however some predators are often perceived as contributors to the decline of salmonids (e.g., mammals, birds, trout, bass, etc). Hatchery produced salmonids can also prey on wild juvenile salmonids in addition to competing for food and habitat.

- Ocean Conditions: Since salmonids spend the majority of their lives in the ocean, oceanic factors have a significant impact on production. Ocean conditions such as water temperature, currents, and the pacific decadal oscillation (PDO) negatively impact the distribution and abundance of salmonid food sources.

- Climate Change: Climatic variations have long affected the condition of salmonid stocks inland, but impacts due to oceanic variations are not as well understood. Drought and water temperature increase in rivers will amplify pressures on already low populations of salmonids. Additional factors such as sea level rise will affect salmonid species by changing estuary conditions where salmonids normally congregate before migrating out to the ocean.

PUBLIC MEETING RECAP:

In August 2008, OPC staff held two public meetings in Sausalito and in Eureka to discuss how California's policies and practices may better protect wild salmonid stocks. A report outlining the major ideas discussed at the meetings is included as an attachment. At the

workshops, staff solicited input from participants regarding the issue of long-term salmon decline (i.e., the past 150 years) and ideas for long-term policy solutions.

Over 80 members of the public representing a cross-section of interests and perspectives participated in the workshops. Commercial and recreational fishermen, conservation and restoration groups, researchers and scientists, state and federal resource managers, and other concerned members of the public were in attendance.

The workshops had two main goals: (1) to identify the top causes of wild salmonids population decline and (2) to receive feedback from the public about how the OPC can help ensure wild populations of salmonids exist in California for future generations.

The results for both workshops were notably consistent: participants identified water supply, water quality, barriers, and habitat alteration as the four top causes of long-term decline of salmonid populations.

Participants expressed a need to address the major issues affecting salmonids and to improve the state's ability to enforce existing laws that enhance salmonid recovery. Participants also identified the OPC as having the influence necessary to implement creative approaches to revive salmon populations.

POSSIBLE OPC APPROACHES

1) Development of an Expert Panel

From the input received at the public meetings and from expert opinion, it may be time to take a step back from the process and rethink how the state is addressing these issues. To address the complex issues associated with restoring healthy levels of salmonids, staff suggests that the OPC work with the Ocean Science Trust to assemble a nationally recognized team of experts to specifically address the challenges in restoring salmonid populations. While it is clear that those who are keenly interested in protecting salmon feel confident about the nature and relative weight of the problems confronting the species, an independent, scientific review of the issues related to salmonid decline is warranted.

A healthy degree of cynicism exists about the need for an expert panel to examine the problem of salmonid decline. Indeed, the state has in the past commissioned numerous reports that have presented policy recommendations and developed restoration actions for specific watersheds or specific species relevant for salmonid conservation (e.g., *The Coho Recovery Plan* and *Restoring the Balance*). However, a scientifically vetted, statewide report that addresses overarching questions aimed at long-term wild salmonid survival has not been completed. The expert panel would address such thorny issues as water policy and would provide recommendations for policy changes. In addition, the panel would ensure that the limited money available for projects is spent as productively as possible.

If the council agrees that such a study might be useful, the panel could be tasked to address a specific scope that will be developed by OPC staff and the Ocean Science Trust

(OST). The panel would make specific statewide recommendations to the OPC on ways to address salmonid decline. The scope could include questions such as the following:

- What are the key stages in the life history of each of the salmonid species (including steelhead,) and which have been/can be affected by human activities? The idea here is to portray the aspects of a salmonids life history that are limiting.

- What human activities have affected wild salmon populations most significantly?

- What tools are most effective at reducing specific human impacts?

- Why have recovery activities not been successful in restoring healthy wild populations of salmonids throughout California?

OPC and OST staff will work to refine these questions and develop a specific scope of work for the panel. Staff will bring the scope to the council in November for approval along with a request for necessary funding. The OST will seek nominations to the expert panel from the public, as well as the OST's Science Advisory Team (OST-SAT). The final appointments to the panel will be reviewed by OPC staff and the OST-SAT to ensure the necessary expertise and range of opinions are represented. Panel experts will need to understand the vast array of issues associated with salmonid conservation and the implications of designing long-term policies and recommendations relevant to management decisions. This panel would be charged with completing and releasing a report without further OPC involvement or approval.

Staff would use the National Academies' National Research Council (NRC) as a model. The NRC model has been very successful in tackling large and complex issues and providing guidance that can be used by government agencies to take decisive action. The NRC has already commissioned two reports related to Pacific salmonids in the West. The first, *Upstream,* offers specific recommendations for salmon rehabilitation that takes into account the key role that genetic variability plays in salmon survival and the urgent need for habitat protection and management of fishing for the entire Pacific Northwest, as well as calling for the development of a scientific advisory board to address critical issues. The second, *Endangered and Threatened Fishes in the Klamath River Basin: Causes of Decline and Strategies for Recovery,* addresses impacts and recovery strategies for the species that inhabit the Klamath watershed. Both studies offer specific recommendations to address similar problems, but neither addresses California as a whole, nor offers specific statewide policy recommendations.

2) In-Stream Flows

Staff has met with DFG and the State Water Board's Water Rights Division (Water Board) on ways to restore salmonid populations throughout the state. DFG has interest in assuring that water flows within streams are maintained at levels that are adequate for long-term protection, maintenance, and proper stewardship of those resources. Pursuant to Public Resources Code 10001, DFG is obligated to "identify and list those streams and watersheds throughout the state for which minimum flow levels need to be established in

order to assure the continued viability of stream-related fish and wildlife resources." OPC staff could support DFG and the Water Board to determine flow levels of rivers and streams that support salmonid runs and that are a priority for the state.

CONCLUSION

The 2008 commercial and recreational salmon seasons have been sharply curtailed in California due to serious declines in salmonid populations. These cutbacks have had significant impacts on fishermen, fishing-related businesses, local communities, tourism, and a large part of the state's cultural heritage. Developing a viable strategy to prevent the extinction of wild salmonid populations in California will require a long-term approach. The California Ocean Protection Act (COPA) states that the OPC should: "coordinate activities of state agencies that are related to the protection and conservation of coastal waters and ocean ecosystems, to improve the effectiveness of state efforts to protect ocean resources within existing fiscal limitations, consistent with Sections 35510 and 35515." It is clear from past conservation efforts that the public policy decisions needed to curb salmon decline will be difficult. There is no simple, single answer, and the benefits to salmon that will flow from any changes in policy may not be evident for years. However, the OPC could provide leadership on approaches that will reverse the long-term trend in declining salmon populations.